EDITORIAL

COVID-19 Vaccination – Evolution to Future Implications

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The Coronavirus Disease 2019 (COVID-19) pandemic has presented a major threat to public health worldwide alongside unprecedented global economic and social implications. In the absence of a "gold standard" treatment, the rapid development of a safe and effective vaccine is considered the most promising way to control the pandemic[1]. Since the declaration of COVID-19 as a global pandemic by WHO; governments, vaccine manufacturers and researchers across the world have started working in collaboration to develop an effective vaccine.

Global coordination of vaccine research and development is provided by the Coalition for Epidemic Preparedness and Innovation (CEPI); Gavi, the Vaccine Alliance; and the World Health Organization (WHO)[2]. Vaccine efficacy is a particularly critical outcome to be measured in these trials and subsequently evaluated by regulatory bodies such as the Food and Drug Administration (FDA) and its international counterparts. In June 2020, FDA adopted a broad definition of vaccine efficacy that encompasses both transmission effects and disease-modifying effects[3]. FDA also established a minimum efficacy threshold, specifying a primary efficacy endpoint point estimate of at least 50 percent to ensure—that a widely deployed COVID-19 vaccine is effective[3].

For vaccine to be effective and completely terminate the infection, it should either complete abrogation or significant reduction of transmission within the population by the induction of herd immunity or prevention of severe disease in all vaccinated individuals. For these two things to be successful it requires production and distribution of large quantities of vaccine worldwide. Herd immunity for SARS-CoV-2 would require vaccination of ~67% of the population[4].

One of the main concerns regarding a COVID-19 vaccine is its ability to provide long-lasting immunity. Research in other coronavirus species has shown that immunity may not be long-lasting, with 2–3 years of protection estimated from work with SARS and MERS[5]. To better understand the immune responses to SARS-CoV-2 and the optimal vaccine profile and administration regimens; one need to address the lack of correlation between antibody titer rates and clinical improvement, the durability of neutralizing antibodies, and their correlation with durable immunity[6] Potential mutations in the S protein may also affect the long-term efficacy of a vaccine. Evidence shows a functionally meaningful S protein mutations that appear to mediate a higher binding affinity when compared with previous SARS viruses[7]. Hence it emphasis the importance of a cost-effective platform that is able to produce different vaccines rapidly and safely using existing production processes and already established manufacturing infrastructure.

The rapid development of an effective and safe vaccine is the only way to control the COVID-19 pandemic. The viral-vector-based and gene-based vaccine technologies are promising novel platforms and have a pivotal role in the new era of vaccinology as potential game-changers in epidemics and emerging diseases. These novel technologies may become helpful in winning the fight against COVID-19 and in transforming the future of health care.